

# Standard Cargo

The Standard



## A Guide to the Carriage of Steel Cargo

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**ERIC MURDOCH**  
CHIEF SURVEYOR  
+44 20 7522 7440  
[eric.murdoch@ctcplc.com](mailto:eric.murdoch@ctcplc.com)



**CHRIS SPENCER**  
DIRECTOR OF LOSS PREVENTION  
+44 20 7680 5647  
[chris.spencer@ctcplc.com](mailto:chris.spencer@ctcplc.com)

### Introduction

When carrying steel products by sea, it is essential to ensure that neither the steel nor the ship suffers damage, that the ship is fit to receive cargo and that the cargo is safely stowed and secured.

Steel is a high-value cargo, a cargo easily damaged by rough handling, water and moisture. Its weight presents substantial challenges with stowage and securing. Incorrect stowage can lead to hull and cargo damage.

Damage can occur during bad weather, when hatch covers leak, or when cargo moves, or when incorrect ventilation procedures are followed. Damage can also occur before loading while the cargo is in storage or in transit from the mill to the ship. The club arranges preloading surveys to check the condition of finished steel before loading to ensure that bills of lading are correctly endorsed with full details of any such damage.

This guide aims to provide an insight into the correct method of loading, stowing and securing steel cargoes. Its advice, if followed, will assist in the avoidance and prevention of steel cargo damage claims.



This is the first of a series of *Standard Cargo* publications that will concentrate solely on the carriage of cargo. It is intended that *Standard Cargo* will be an easily understood and accessible reference guide for the master, cargo officers and shore operations staff.

Chris Spencer

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# 1. Steel manufacture

Steel is manufactured from iron during a process in which most of the iron's carbon is removed, producing a tougher and more ductile material.

Steel is smelted from iron ore in a process involving heat, coke, limestone, oxygen and scrap steel. Manufacture takes place in a furnace, of which there are two types in common use: the basic oxygen furnace and the electric arc furnace.

When manufacturing steel using the basic oxygen process, iron ore, coke, limestone, scrap steel and sinter (iron-rich clinker) are fed (charged) into a hot furnace. Hot, oxygen-enriched air is blasted into the bottom of the furnace (hence the name blast furnace) until the iron in the ore and sinter melts, forming a pool of molten metal at the bottom of the furnace. Limestone, molten rock and other impurities form a liquid slag on top of the molten metal. The molten metal, which is called 'hot metal', is run off for further processing. The slag is discarded.

When manufacturing steel with the electric arc process, cold scrap steel is placed in a circular closed chamber and electrodes are lowered into the scrap. A powerful electric current is passed through the scrap, causing arcing, with the heat generated melting the scrap.

The electric arc process is generally used to manufacture high-grade steel products, such as stainless steel.

After leaving the furnace, the hot steel passes through a secondary steel-making process to improve its quality, before it is cast into slabs, ingots, billets or blooms. The process of casting steel slabs, ingots, billets and blooms is known as continuous casting, because the process never stops. If the steel mill has rolling equipment, the hot metal may be rolled rather than cast.

Slabs, ingots, billets and blooms are often shipped by sea, in transit to a rolling mill where they can be rolled into long products such as profiles, beams and channels. Steel slabs are rolled into plate. There are two rolling processes, hot and cold rolling. Hot rolling takes place when the steel is red hot, and cold rolling after cooling. During hot rolling, the steel product is formed. During cold rolling, the product is improved and made ready for sale.

Hot metal and reheated steel slabs can be hot rolled to form strip steel, a thin sheet of steel up to two metres wide. Strip steel can be coiled for storage and shipping. Steel that has been rolled when hot and coiled is known as a 'hot-rolled coil'.

Hot-rolled steel coils may be unwound for further rolling, only this time the metal will be cold and the process called cold rolling. Cold rolling is the final step in steel manufacture; after cold rolling, the steel is ready for use. Cold-rolled thin sheet steel could be coiled again, to create a 'cold-rolled coil'.

Cold rolling improves the steel's surface quality in readiness for sale.

Hot and cold-rolled steel coils are frequently shipped by sea. Even though some, but not all, hot-rolled coils will undergo a further manufacturing process, it is important for them to be delivered free from excessive rust and/or physical damage. Cold-rolled steel coils will not be further processed and when unwound can be used to make steel panels, such as car body parts. Cold-rolled steel coils have to be delivered to receivers in pristine condition.



## 2. Basic advice

The following checks and actions should always be taken when carrying steel:

### Stowage

- read your company's instructions on the safe carriage of steel, your ISM requirements, the advice in the cargo stowage and securing manual. Cross-reference with industry publications such as the Code of Safe Practice for Cargo Stowage and Securing, and Thomas' Stowage. This guide may form part of the ship's cargo manual
- avoid stowage in spaces without parallel sides but when this is unavoidable and frequent loadings are expected, arrange for the space to be permanently 'squared off' with a steel buttress or heavy-duty timber. Pay special attention, because of the hull's shape, to No. 1 hold
- mark the holds' strong points, such as solid floors, on the tank top. Extend the marks up the hold sides. These are the best load-bearing positions. Marking them will make it easy to check whether cargo and dunnage is correctly positioned during loading
- find out in advance the proposed loading plan. Check whether the best, rather than the easiest, stow is proposed. If loading steel coils, check that key coils are correctly positioned and tank top point loads are not exceeded. Estimate the loaded metacentric height (GM) by using the correct vertical centre of gravity for the loaded steel. Avoid very high GMs. Bear in mind the probable weather to be encountered during the voyage and that high GMs are associated with heavy/violent ship rolling
- enquire into the proposed method of stowing and securing cargo. Meet with the stevedore superintendent and/or supercargo to discuss the loading plan. Use this as an opportunity to point out any limitations with the ship or its equipment
- steel should not be loaded in the same compartment as chemicals, fertilisers, sulphur or other cargoes that could cause damage

### Dunnage

- steel is a very high-density cargo. To avoid damage to the ship's structure and to enable an even weight distribution, carefully apply dunnage between the ship and cargo, and within cargo tiers. Lay dunnage over strong points
- laying dunnage is an important part of safe and efficient carriage of steel. Ship's officers should ensure that dunnage is laid properly

#### Apply dunnage to:

- create frictional resistance
- spread the load. Always use sufficient strips of dunnage to avoid exceeding the tank top acceptable point load. As the height of a stow increases so too does the requirement for additional strips of dunnage

- avoid deformation of the cargo, especially when loading steel plate, coils and railway lines

- protect steel from moisture

- reduce possible movement within a stow, especially when carrying steel plate or slabs

- use dunnage of sufficient thickness to enable efficient weight distribution and to facilitate cargo lashing/handling. Only dunnage certified for ship use should be used, that is, dunnage with a plant quarantine stamp. In some ports, port officials will want to inspect dunnage certificates

### Loading

Steel is generally loaded in the following manner:

- **coils** should be stowed across the ship, on stout dunnage, with their axis fore and aft. Use wedges to safely locate coils during loading. Base coils should be loaded from the ship's side inwards to the centre and wedged, with the wedges placed below on their in-board side. Once at sea, the ship's motion will cause the coils to settle as the weight of the key coils tightens the stow. Wedges placed either side of a coil will prevent this. However, when more than one key coil is used, and to locate their position during loading, double wedging is necessary on either side of the centre supporting coil(s). Coils are secured with steel banding to each other in varying forms. Pneumatically tightened steel bands, binding the coils to those stowed immediately below, are preferred. Key coils are positioned so that their bottom edges are one-third of a coil's diameter below the top of the coils in the tier being locked, in a gap that is not greater than 60% of the key coil's diameter
- **wire coils** should be stowed vertically, with their axis fore and aft, adjacent to each other in a similar configuration to the stowage of steel coils



No.1 hold is 'squared off' with a steel structure.

- **plate** should be stowed in the fore and aft direction, with dunnage running athwartships and between each tier. Stowage should be from one side of the ship to the other, leaving no voids, and the top layer secured with wire or chain bindings. When loading thin plate, stowage in subsequent tiers can be in alternate directions
- **long products**, such as pipes, channels, angles, beams, flats, rounds and re-bars, should be stowed in lower holds in the fore and aft direction, with dunnage placed athwartships. Avoid mixing products of different type and length in same stow. Place dunnage between tiers. The top tier should be secured to the ship
- **semi-finished steel slabs** should be stowed in the same manner as steel plate. California Steel Industries (CSI) recommends vertical stowage with tight lashing of top tiers. See page 15 - California block stowage
- arrange a preloading condition survey of all finished steel before loading. Do not confuse finished steel with project cargo. Finished steel is:
  - hot or cold-rolled steel coils
  - steel wire coils
  - steel plate, bars, profiles, channels, angles and joists
  - sheet steel
  - steel pipes

Project cargo, if surveyed, will be checked for damage, stowage and securing by surveyors for cargo insurers, while surveys of finished steel before shipment are generally arranged by the P&I insurer

- avoid loading wet steel. Wet steel has less friction and can give off moisture. Moisture causes steel to corrode. However, if loading cannot be avoided, do not stow wet steel adjacent to, or in the same compartment as, dry steel. Endorse the bills 'wet before shipment'
- closely monitor stevedores during application of cargo lashings, when laying dunnage, when placing key coils and when fitting wedges. They may not follow best practice
- ship's officers should monitor stevedores to ensure:
  - they use the correct equipment and do not damage the cargo. Steel wire slings or chains when used incorrectly can damage bundles of pipe, plate and/or steel coils
  - forklifts are fitted with proper lifting tines
  - stowage and securing is as per the cargo plan
  - cargo is not loaded wet or during periods of rain
  - details of cargo damage are correctly recorded
- ship's officers should also monitor the surveyor performing the preloading survey and be available to assist
- a detailed log of cargo operations should be kept, including information on where and how cargo was stored on the quayside, how cargo arrived at the berth, what were the weather conditions and what was the cargo's apparent condition on loading

## Cargo care

- steel cargoes are easily damaged by salt water. Before loading, test hatch covers for watertightness and repair the covers if leakage is found. Test with ultrasonic hatch cover testing equipment. After loading and closing hatch covers, apply cross-joint wedges before hatch skirt cleats. For further information on maintenance of cleats and closing of ships' hatch covers, see the club's publication 'A Master's Guide to Hatch Cover Maintenance'. Additional protection, such as sealing foam and tape, can be applied along hatch cover cross-joints in exposed areas of the ship and especially on No.1 hold if the ship does not have a forecastle. Avoid loading ballast in wing tanks when holds contain steel. Ballast should be carried only for trim and stability purposes, and propeller immersion
- fit dehumidifiers in holds when steel is loaded in winter or cold conditions for discharge or passage through areas in summer/warm conditions. Dehumidify holds as the outside air temperature rises. Make sure dehumidifier cabling does not compromise the integrity of the hold or pose a fire hazard. Lead dehumidifier drains directly to hold bilges, which should be pumped dry regularly. Keep records of bilge pumping operations
- during the voyage, control the dew point in the cargo hold by ventilation or by dehumidifying the air
- take daily dew point temperatures of hold and outside air with a wet and dry bulb thermometer. Ventilate when the dew point of outside air is less than the dew point of hold air. This will normally occur when cargo is loaded in warmer conditions for delivery to a port, or passage through an area, with colder conditions
- keep detailed records of hold and outside air temperature, at the load port, during the voyage and at the discharge port. Record times of hold ventilation and of heating fuel in tanks adjacent to holds loaded with steel
- when testing steel surfaces for chlorides (salt) with silver nitrate, a resulting milky solution shows the presence of chlorides. It does not necessarily show that sea water entered the hold either through hatch covers or the hull







### 3. Steel commonly shipped by sea





This section discusses steel that is commonly shipped by sea.

Finished steel products					
	DESCRIPTION	USE	USUAL STOW	NOTES	SURVEY REQUIRED
	Cold-rolled coils	Finished sheet steel in a transportation coil. 2 to 28 tonne weights	Athwartships – Bottom stow	Coils will not be further processed but unwound and used	Yes
	Hot-rolled coils	Sheet steel being transported to a rolling mill in 2 to 28 tonne weights.	Athwartships – Bottom stow	Coils usually unwound and cold rolled	Yes
	Coiled wire rod	Long steel bars formed by hot and cold rolling	Fore & aft	Can be damaged/ squashed by high stows. Often left on the quay and can be loaded in the rain	Yes
	Profiles	Long steel bars formed by hot and cold rolling	Fore & aft	Used to reinforce steel structures	Yes
	Channels	Long steel bars formed by hot and cold rolling	Fore & aft	Used to reinforce steel structures	Yes
	Angles / Bulbs	Long steel bars formed by hot and cold rolling	Fore & aft	Used to reinforce steel structures	Yes
	Girders	Long steel bars formed by hot and cold rolling	Fore & aft	Used to reinforce steel structures	Yes
	Plate	Thick steel in finished form after cold rolling	Fore & aft or athwartships in bundles	Used in the manufacture of all sorts of steel structures	Yes
	Reinforcing bars (re-bars)	Hot-rolled steel bar with a rough finish	Fore & aft	Used to reinforce concrete	No

## Finished steel products continued

	DESCRIPTION	USE	USUAL STOW	NOTES	SURVEY REQUIRED
	Small-diameter pipes	Finished steel loaded in bundles	Fore & aft – often pre-slung	Top tier lashed and secured	Yes
	Large-diameter pipes	Finished steel loaded singly or in bundles	Fore & aft	Ends prone to contact damage	Yes
	Coated steel pipes	Finished steel loaded in bundles or cradles	Fore & aft	High value. Easily damaged by rough handling	Yes
	Sheet piling	Used in construction industry	Fore & aft	Not usually further processed	No

## Other steel products

	DESCRIPTION	USE	USUAL STOW	NOTES	SURVEY REQUIRED
	Ingot	Raw steel before rolling	Fore & aft	Processed to make steel bars and plate	No
	Slab	Raw steel before rolling	Fore & aft or athwartships	Processed to make steel plate	No
	Bloom	Raw steel before rolling	Fore & aft	Processed to make steel bars	No
	Billet	Raw steel before rolling	Fore & aft	Processed to make steel bars	No

## 4. Steel cargo surveys

Shipowners have an obligation to cargo receivers to deliver cargo in the same apparent condition as loaded (shipped).

Finished steel products can suffer physical damage or rusting during transit from the steel mill to the port, or during storage at the port.

Finished steel is most problematic because, at the discharge port, it is difficult to determine whether the damage occurred before loading or while on board. Consequently, it is essential to examine finished steel for defects before loading and to identify and record any damage or rusting. This information is needed to prove to cargo receivers that such damage occurred prior to shipment and not on board the ship.

P&I clubs arrange preloading surveys of finished steel as a means of preventing shipowners facing pre-shipment cargo damage claims where damage occurred before loading. The club's rules require the survey as a condition of cover:

*“unless the board otherwise determines, there shall be no recovery in respect of liabilities arising out of the carriage of finished steel products, unless the member has arranged for a preloading survey to be carried out by a club-approved surveyor at each port of shipment, and the bills of lading have been claused in accordance with the findings of the surveyor as to the condition of cargo at the time of loading”*

Generally, clubs will only want to survey finished steel, that is, **products that will not be processed in a steel mill before being used in a manufacturing process.**

**Finished steel includes:**

- hot or cold-rolled steel coils
- steel wire coils
- steel plate, bars, profiles, channels, angles and joists
- sheet steel
- steel pipes

**Finished steel excludes:**

- steel billets, ingots, blooms and ore
- semi-finished steel slabs
- scrap steel
- steel re-bars and D-bars \*
- project cargo and or flat-packed steel structures

\*Although reinforcing bars are 'finished' and do not undergo further processing at a mill, the club does not generally survey them.

### Survey procedure

Preloading steel surveys are usually undertaken by surveyors appointed by the P&I club. The surveyor has a number of duties, the most important is to examine cargo for damage and to advise the master on suitable clauses to endorse on the mate's receipts and bills of lading. However, surveyors should also examine the ship's hatch covers, cargo holds and observe stowage, pointing out to the master any hatch cover defects that could give rise to leakage and any aspect of stowage that appears incorrect.

When examining steel cargo, surveyors will be checking:

- where the steel was manufactured, how the steel was transported from the steel mill to the port, where the steel was stored in the port prior to arriving at the berth and how the steel is protected from damage and the elements
- for physical damage, rusting, wetting and possible contamination with salt and/or chemicals. For example, steel stored close to the sea, or delivered by barge, can become contaminated with wind-carried salt. At times, the steel itself cannot be examined because of its packaging. In which case, the surveyor will pay close attention to the condition of packaging and whether this is damaged, missing or wet. He will also comment on bindings, such as steel straps
- that hatch covers are free from defects and that drainage channels are clear

**CONTINUED ON PAGE 8**



The surveyor will want to:

- examine steel while it is in storage in the port, noting storage conditions
- examine each parcel of steel on the quay before loading. Otherwise, the examination will take place in a marshalling area
- note any exceptions with the steel, carefully describing the damage and identifying the damaged steel by reference to plate numbers and or identification tags. Later it will be necessary to endorse bills of lading and mate's receipts with details of the damage. There is suggested wording contained in this guide. At times, the surveyor will recommend not to load badly damaged cargo

Occasionally, the surveyor will ask for assistance from the duty deck officer. This may be because:

- cargo is being loaded in more than one hold at the same time
- cargo is being loaded during a 24-hour period but loading is erratic and intermittent
- the surveyor is checking other cargo and recording details of damage as loading continues

The duty deck officer should always provide assistance.

When recording details of the cargo's condition, surveyors should always make detailed notes of any damage seen regardless of whether it is damaged packaging or very minor blemishes on the cargo. Everything needs to be accurately recorded by the surveyor. At times, the steel may appear to be in 'typical condition' for the type of cargo, even though there are minor blemishes. However, if the steel is in less than perfect condition, the true condition of the steel should be recorded by the surveyor and itemised in his report. The description has to be precise because it may be necessary to prove to the receivers, for example, that bundle 'A' had six bent bars and bundle 'B' five. It is no good saying, '150 bundles of steel bars loaded and 95 show minor buckling and scratches', because nobody will know which 95 are damaged. The 95 bundles with damaged bars will need to be clearly identified by the steel mill's identification marks, or the shipper's docket, so that the receivers can verify that the 95 bundles they found damaged are the same 95 bundles found damaged by the surveyor before loading.

Surveyors who come on board at the discharge port may represent receivers, in which case, their credentials should be checked and approved before allowing them access to cargo. Allow only surveyors whose credentials have been approved to take photographs of cargo.

There will be occasions when an independent tally of coils will be required. Ask the surveyor who is conducting the preloading survey whether he can assist.

## Silver nitrate testing

Silver nitrate tests are performed as a means of detecting chlorides, in this case salt (sodium chloride). Silver nitrate is a clear solution, which goes milky white when mixed with chlorides.

This test is made whenever there is an allegation that steel has been damaged because of contact with salt water. If the test is positive, claimants are likely to pursue a cargo damage claim.

### Test procedure

- the silver nitrate solution should be kept in a dark bottle fitted with a dropper
- before testing, check the area being tested for contamination
- squeeze a few drops of the silver nitrate solution onto the wet or rusty area, ensuring that the fluid does not come into contact with hands
- observe the result. The solution will change colour quickly and markedly when there is a strong presence of chlorides
- ensure that the dropper does not touch the wet or rusty steel or hands. This may affect future results

Positive results show that chlorides are present on the steel. It does not show that sea water entered the hold either through hatch covers or the hull. Chlorides can be present for other reasons:

- the hold was washed with salt water and not finally rinsed with fresh water
- wind-blown salt has accumulated in the hold and condensation caused salty water to drip onto the cargo
- salt was deposited on the steel before loading. Surveyors undertaking a preloading survey should check for salt contamination

At the start of the voyage, it is important to ensure that hatch covers are watertight, that the bilge system is tight, that holds are free from salt water residue or dry salt, and that any salt contamination found on the steel prior to loading is accurately recorded on the bill of lading.

If chlorides are found, it is important to advise the shippers as soon as possible. The bills of lading and mate's receipts will need to be endorsed, and shippers may wish to separate the affected cargo.



## 5. Bills of lading

A bill of lading is a record of the quantity of cargo on board and of its apparent order and condition at the time of shipment. As such, it is a vitally important document. Cargo damage or shortage claims can arise as a result of errors in the quantity and condition of cargo described in a bill of lading. The bill of lading also represents the cargo itself, and possession of the original bill indicates who is entitled to receive the cargo at the discharge port.

The description of cargo on the bill has to accurately reflect the condition and quantity of cargo loaded. Any cargo defect or damage that may exist prior to loading needs to be accurately endorsed on the bills before they are signed.

Rusting is often described by reference to a percentage of the surface affected. This can be very difficult to quantify in practice. Rust percentages can vary from piece to piece with, for example, one side of a beam being totally rusty and the other side not rusty at all. The International Group of P&I Clubs standard clauses for steel can be broadly broken down into three categories – rust spotted, partly rusty, and rusty with up to 15%, 15% to 75% and over 75% of the visible surfaces affected by rust respectively. Use these if unable to estimate a percentage.

### Clauses

The following or similar clauses should be used to describe damaged steel on bills of lading:

#### DESCRIPTION



Flat bound steel plate reference number xxxx rusted xx% of its surface and buckled along its edge



Profiles reference number xxxx – flanges/webs/corners/edges – bent/buckled/distorted, along xxxx of its length



Coils reference number xxxx – ripped/torn/distorted – along/in/around xxxx position



Plate/bar/channel/profile reference number xxxx – dented/pitted in xx places and along xxxx% of its edge



Plate/bar/channel/profile/coil – reference number xxxx – loaded in wet/damp/rain/snow/ice conditions before shipment



Plate/bar/channel/profile/coil – rust spotted/partly rusty/rusty before shipment



Plate/bar/channel/profile/ coil – rusted xxxx% overall.

## 6. Principles of stowage

Steel is shipped in a variety of shapes, sizes and weights. Consequently, it is difficult to stow in classic block stowage. Careful preparation of the hold is essential.

When loaded in a ship's hold, steel is placed on dunnage, and dunnage is placed between successive tiers of cargo. Dunnage has two functions. To spread the steel's load uniformly in relation to the ship's structure and to provide frictional resistance. Insufficient or incorrectly applied dunnage can result in high point loads on the ship's tank top, possibly deforming it. When laying dunnage, place it along the top of a solid floor.

Steel is generally loaded in the fore and aft direction, with part cargoes loaded forward from aft. When loading coils, wedges may be used below the coils, placed on their in-board side to locate a coil as it is stowed. A key coil will always be used to lock a row of coils with the key coil in subsequent rows placed in a different position. Key coils take up any gap that may occur between coils during ship movement.

Coils are stowed in rows or tiers, and are generally placed in the hatch square before stacking with a forklift. As each successive row or tier is completed, the coils are lashed before the next row or tier is loaded. A small gap is left between each successive row.

The hold area used for landing coils has to be free from debris and/or raised objects. Landing a coil on a bulldog grip, ring bolt or shackle will cause considerable damage to the coil. When lifting coils with a forklift, only forklifts with coil-friendly tines, those fitted with a single central lifting arm, should be used.

Steel is lashed using wires, chains and steel bands. Pneumatically tightened steel bands are preferred for coils. When using wire lashings, suitable chafing pieces should be inserted between the lashing and the steel's edge. Standing faces of coils are lashed (banded) back to the second row.

To allow access for lashing, coils are usually stowed with a 20 to 30 cm gap between rows and/or a transverse bulkhead.



Forklift with a coil-friendly tine.

The lashing procedure for coils involves securing the top coil to the coil immediately below, rather than securing the entire stow to the ship. By this method, the top coils act as a cap holding the remainder in place.

Profiles and plate are secured by a variety of methods with the objective of preventing initial movement. With the exception of coils, lashings that do not ultimately connect to the ship's structure will be of little value. When assessing the value of lashings, it is necessary to consider how the cargo has been stowed, the potential for movement and how movement is prevented. Frictional resistance is the principal means by which movement is suppressed.

During loading, the ship's cargo officers must maintain a diligent watch and record cargo activities during the watch. Good records can prevent and reduce certain claims, and support any clauses made in the mate's receipts and bills of lading.

The watch officer should report to the master and note in the cargo record book:

- any cargo damage
- any stevedore damage to the ship
- the cargo's condition
- instructions given to stevedores and/or lashing gangs
- times when hatches were open or closed
- stoppages due to weather

In addition, photographs of cargo can be taken.

Ports that specialise in steel have skilled stevedores and specialist equipment for stowage and securing. Greater vigilance is needed if loading in non-specialist ports.

## Round products – coils

Steel coils should be loaded in a minimum of two tiers or layers. When loaded in a single tier, locking the tier is essential. This is done by placing a coil to force those beneath it into a tighter stow. This coil is known as a key, or locking coil. A key coil is most effective when placed at the centre of a row. However, it is important to avoid a continuous line of weight on the ship's tank top and, consequently, key coils placed in subsequent rows are staggered. Great care needs to be exercised when placing key coils.

Key coils are placed so that the coil's bottom edge is one-third of its diameter below the top of the coil(s) being locked. This will correspond to a gap between the coils being locked of about half the key coil's diameter. However, if the gap is greater than 60% of the key coil's diameter, then the key coil could be damaged or crushed. In which case, two key coils are needed. Timber may be inserted to raise a key coil and to satisfy the 30% requirement.

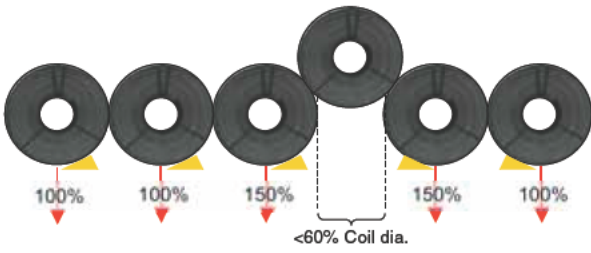
When a key coil is placed above different-sized coils, the smaller coil takes the most weight. Care is necessary to avoid damage to the smaller coil.

Stevedores may attempt pyramid loading, a method that should be avoided, because excessive weight can be transferred to the ship's tank top and because it is difficult to lash pyramid coils.





**Single tier key coil**

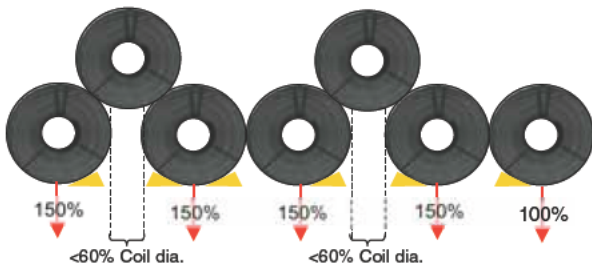


150% means 1.5 times the coils weight.



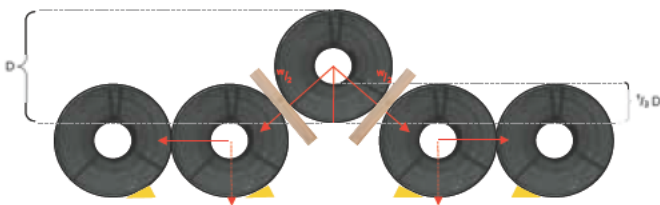
Coils correctly stowed with dunnage, wedges and a key coil.

**Single tier two key coils**



Coils tightly stowed with centre line key coils and multiple key coils fore and aft.

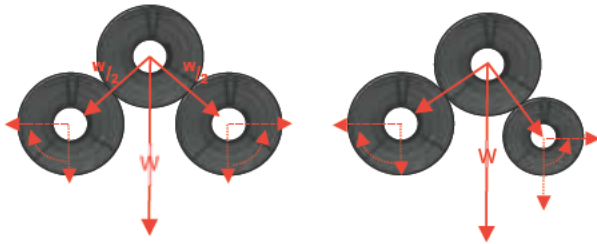
**Single tier one key coil with supporting dunnage used when the key coils gap is greater than 60% of the coils diameter**



This key coil appears to exceed the 60% rule.

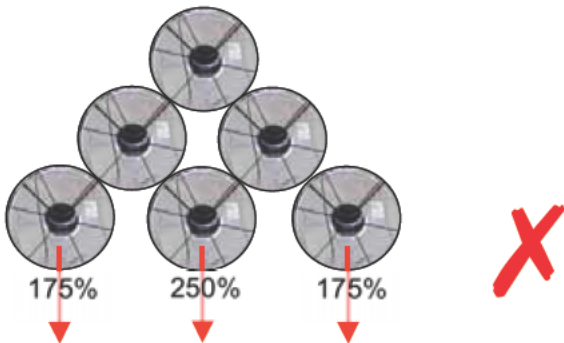


### Single tier one key coil with different-sized coils

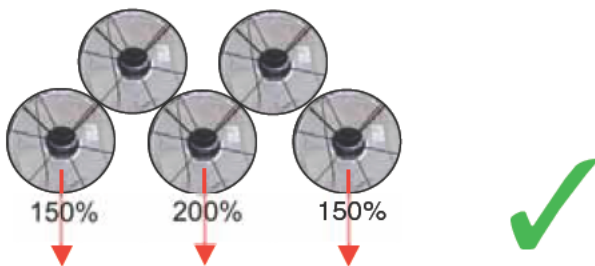


When different sized coils are loaded and keyed together, the majority of weight is on the smaller coil.

### Pyramid loading - Incorrect



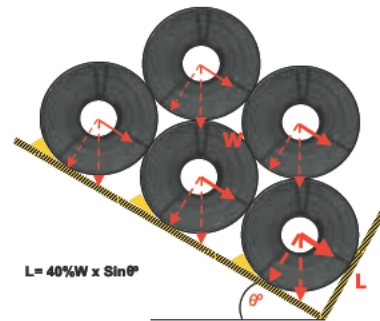
### Correct



Pyramid loading should be avoided because excessive weight can be transferred to the tank top and because it is difficult to secure the top coil. In the above diagram showing pyramid loading, it is seen that 2.5 times the centre coil's weight is passed to the tank top. In non-pyramid loading, only twice the coils' weight is passed to the tank top.

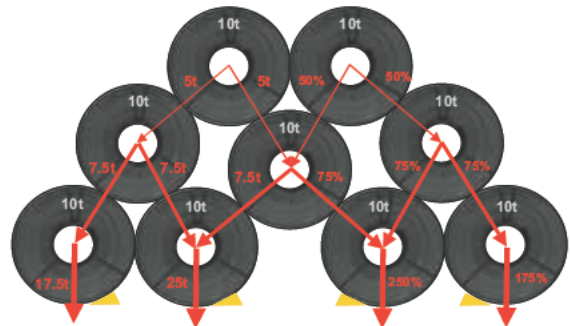
When coils are loaded against the ship's shell, they exert a force. This force can be estimated by multiplying 40% of the weight of the coils, which place a force on the shell, by the sine of the stowage angle. A similar calculation can be made for roll, where the weight is multiplied by the sine of the angle of heel.

Side dunnage can be used to reduce point loads



Weight from cargo can be transferred to the ship's shell.

A 50% rule can be applied when calculating weight passed down through a stow of coils to the ship's tank top. This process is demonstrated in the sketch below. It also shows why pyramid loading can give rise to excessive forces on the ship's tank top.



50% of the weight of a coil in an upper tier is assumed to pass to the coils below and to the tank top.

## Imperfect and damaged coils

Damaged coils being returned to a steel mill are shipped as steel cargo rather than as scrap. Special care is necessary when loading and stowing them. Badly damaged coils should be stowed in the second or top tier and independently lashed or shored. Do not load cargo on top. Extra securing and additional chocking may be required to secure the stowage.

Damaged coils carried as cargo should have the damage accurately described on bills of lading or mate's receipts.



## Coiled wire rod

Coils of wire rod are stowed in a tight block stow, with their cores fore and aft on plywood sheets placed on wide dunnage. Direct contact between the coils and the ship's tank top should be avoided. Wire coils are wedged to avoid movement. Standing faces should be avoided but, if not, lash the coils back to a bulkhead by passing a wire through their core.

Care should be taken when lashing with chain because chain can damage steel. This can be prevented by placing dunnage at the point where the chain contacts the steel.

After loading, wire coils will settle and mesh together and no further lashing is necessary, except for those coils that are not held in a block stow. When cargo is locked together, care is needed during discharge to avoid damage: inform stevedores at the discharge port of this requirement.



Coiled wire rod correctly stowed in a square hold.

## Flat products – plate and slabs

Steel plates are generally stowed with their longest axis fore and aft, on dunnage laid athwartships. Cargo is loaded from the hold's side to its centre. Dunnage is placed between adjacent plates.



Steel plate is stowed fore and aft on athwartship laid dunnage in a square-sided hold.

Long plate is susceptible to waviness. Sufficient rows of dunnage are needed to prevent distortion. The higher or heavier the stow, the greater the number of pieces of dunnage required. Less dunnage can be used higher in the stow, provided there is sufficient dunnage to support the plate and prevent buckling. In addition, dunnage has to be sufficiently thick to facilitate cargo handling and lashing.

Gaps between parcels of steel plate have to be chocked with strong timber. Any wooden structure built to support steel has to be self-supporting, otherwise, the structure could collapse if the cargo moves.



Plate on athwartships dunnage.



At sea, when conditions allow, check 'chocking and tomming'. Remember that cargo holds should only be entered after following your company's cargo space entry procedures and only when sea conditions allow safe working on deck.

## California block stowage

This is used to stow semi-finished steel slabs.

Mariners have learned by experience that a tight stow, without spaces, is a good stow; a stow that is unlikely to shift; a stow that is safe. So they are extremely sceptical about the California Steel Industry (CSI) method for stowage of semi-finished steel slabs because the slabs are stowed vertically, without interlocking plates, without restraint to the ship's structure, and with gaps between the ship's side and the cargo.

This method of stowage relies on frictional resistance and can be used only for semi-finished slabs, steel with a very rough surface. When loaded, the slabs do not follow the hold's shape but are stacked flat in a vertical stow, one on top of the other, interspaced with dunnage. It is extremely important to keep the stack vertical; dunnage is used at the sides and between columns to facilitate stacking. Typically, the slabs are loaded eight high, with the top three slabs lashed together to form a cap, which secures the top plates. There are no lashings to the ship's structure. It is normal to load the wings of a hold first, with slabs placed in the fore and aft direction. However, if the holds have deep wings then stowage may remain in the hatch square. Each slab weighs about 10 tonnes.

California block stowage relies on the high co-efficient of friction of semi-finished steel slabs to prevent movement. Indeed, static tests by CSI on a single unsecured steel plate found that it would not move until tilted to an angle of more than 32 degrees from the horizontal. Detailed theoretical study by CSI found that roll angles in excess of 50 degrees would be needed to move the stow. Since it is friction that prevents each plate from shifting, the method is only suitable for cargoes with a very rough, dry surface.

Take extreme care when using this method of stowage. Avoid using it unless absolutely necessary. Never use it for smooth-surfaced steel plate, wet plate or in holds that are not box-shaped, except when the hold has been 'squared off'.

High values of GM can lead to violent ship rolling and very high dynamic forces on cargo. Avoid high values of GM.



## Long products – bars, profiles, angles, channels, beams and girders

### Profiles

Steel profiles should be loaded 'winged out', stowed so that the ship's side provides support. When this is not possible, tightly stow the profiles and secure them with chains or wires leading to the ship's structure. Unlike coils, profiles should not be lashed to themselves but lashed to the ship's structure.

At times, long products are secured together with banding in an 'Olympic' style of lashing, with wires and bottle screws designed to lock the top tiers and prevent longitudinal movement. The bands are applied as the stow progresses and cargo is bundled together and interconnected.



**First tier of nested I-Beams stowed in the hatch square. Tightly stowed I-Beams are secured with chains to deck fittings.**

Lay dunnage athwartships, not only to spread the load but to provide a friction pad.

### Pipes

Loose pipes are generally stowed fore and aft, in a box-shaped hold, laid on dunnage placed athwartships and loaded from aft. If stowed in an irregular-shaped hold, such as No.1, 'square off' with wooden shoring before loading begins. Use wedges on the first tier of pipes. This helps with alignment and is safe.

Smaller pipes are loaded in bundles. Pieces of timber can be included within the bundles, placed horizontally between the pipes. Even though the pipes are separated by timber, the normal amount of dunnage should be applied, and the usual care taken to lay dunnage on the tank top and to place dunnage between successive tiers of cargo.



**Bundles of coated pipes are stowed with vertical chocking.**

When long pipes are stowed athwartships and their ends are adjacent to the side shell, dunnage should be placed vertically between the steel and the shell. This will stop steel that shifts from piercing the hull.

Additional securing and/or chocking should be applied when loading in the fore part of the ship.



## 7. Principles of securing

Steel is prevented from shifting by friction between the steel and dunnage. Lashings prevent initial movement.

A variety of methods are used to secure steel. Here is some general guidance:

- always consult the ship's cargo securing manual before applying lashings
- lashings are not designed for the most violent storms encountered at sea
- the purpose of lashing cargo is to prevent initial movement. The majority of restraint comes from frictional resistance between the steel and the dunnage
- smooth-surfaced steel that is wet has almost no frictional resistance
- it is only steel coils and slabs, stowed in the method known as California block stowage, that are secured to themselves; otherwise lashings should be secured to the ship's structure
- long products and plate may be intermediately lashed to themselves in order to bundle the steel together and produce a tighter stow
- lashings placed across the top of the stow are of no value. Lashings around a stow serve only to hold the steel in a block
- loosely fitted lashings serve no useful purpose
- steel wires and chain can cause damage if applied directly to steel being lashed
- insert dunnage between steel and the lashings to increase friction and to prevent damage

### Friction

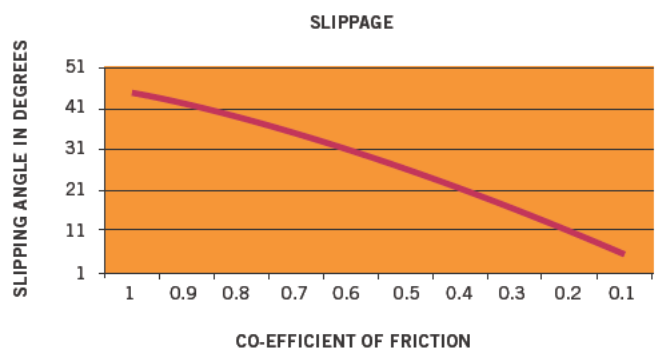
Friction is important as it prevents cargo movement during ship rolling. The table below shows the co-efficient of friction for smooth plate. It is interesting to note that wet steel-to-steel surfaces are considered to have no friction at all.

Steel with a rough finish will have higher values than those listed below.

Friction co-efficient table for smooth plate	
Materials in contact	Friction co-efficient ( $\mu$ )
Timber to timber, wet or dry	0.4
Steel to timber or steel to rubber	0.4
Steel to steel, dry	0.1
Steel to steel, wet	0.0

Water or oil reduces friction. Slippery decks will contribute to cargo sliding, so it is important to keep decks clean and free from oil. Any leaks from winches, hatch motors and piping should be repaired. Check cargo for leaking oil and, wherever possible, deal with this as well.

Actual co-efficients of friction are normally expressed as the angle of inclination rather than the figure given in the table. It is given as the angle of inclination, from the horizontal, at which movement between the two surfaces first occurs, without application of external force.



Assuming that the co-efficient of friction of dry steel-to-steel surfaces is 0.1, the corresponding slippage angle is approximately 6 degrees. In other words, when loose dry steel is stowed with metal-to-metal contact, without dunnage or lashing, it will shift when inclined to an angle of 6 degrees. This angle is easily reached during ship rolling. When steel is placed on dunnage, the angle is increased to 21 degrees. Therefore, lots of dunnage should be used to avoid shifting.

These examples ignore acceleration forces induced during ship rolling.

## 8. Cargo officer's duties during steel cargo loading / discharge

A diligent cargo watch is an important tool to prevent avoidable claims.

Watch officers should ensure that:

- the hold is ready to receive cargo and stevedores understand the loading plan
  - stevedores should correctly use the right equipment so as not to damage cargo. Steel wire slings or chains when not used correctly can damage bundles of pipe, plate or steel coils. Steel lifting rods, for example, are often used for safe lifting of heavy steel coils
  - stevedores are carefully monitored and not allowed to handle cargo roughly or to stow it badly. A significant proportion of steel cargo damage can be attributed to the manner in which stevedores load and discharge cargo
  - forklifts are fitted with proper lifting or protective tines
  - all damage to finished steel cargo is noted by the cargo watch officer and presented to the shipper's or receiver's agents by the master. In such circumstances, if the P&I club steel surveyor is attending, pass details of the damage to him as well
  - assistance is provided to the appointed steel surveyor during a preloading survey, and that the survey is carried out in a diligent manner with discrepancies reported to the master
- lashing and stowage is carried out as per the cargo plan. It is vitally important for safe carriage of cargo and ship safety that steel is loaded in the proper manner. If it is not, it should be reported to the master and owners/charterers immediately
  - keep a log of all activities, including:
    - details of any cargo damage
    - where and how the cargo was stored, in the port and on the quay, i.e., was it stored raised from the ground on dunnage and protected from rain?
    - how cargo arrived at the berth. Did it arrive by rail/truck/directly from the warehouse or was it shifted by a forklift truck?
    - weather, was it raining during loading/discharge? Was the steel wet?
    - whether stevedores were using the correct lifting equipment so as not to damage the cargo
    - times when hatches were open and closed and times of cargo operations
    - condition of the cargo (take photographs)



## 9. Ship husbandry and steel cargo

### Stability

The ship's stability will need to be calculated for the proposed loading to make sure the GM is acceptable.

Large quantities of steel stowed in the bottom of a hold will cause the ship's centre of gravity (KG) to reduce considerably, possibly giving a high GM. This can make the ship 'stiff' and cause violent rolling in bad weather, something that can cause cargo to shift. If loading does result in an unacceptably high GM, and this cannot be corrected by ballast or moving weights, then an alternative stowage arrangement will be necessary.

Weather route to avoid swell conditions that cause heavy rolling and wavelengths equal to half the ship's length, which can initiate parametric rolling in slender ships during pitching in head seas.



Coil prior to stowage correctly wedged.

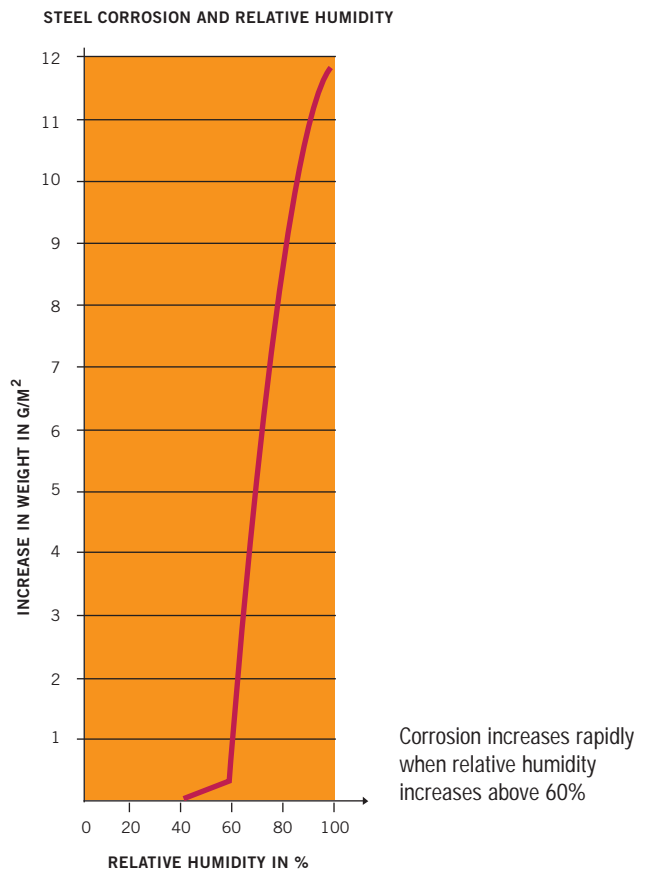
### Corrosion and relative humidity

Atmospheric corrosion of steel starts when the relative humidity (RH) of air reaches 40%. The corrosion rate increases slowly until RH reaches 60% and, thereafter, it increases rapidly. Other elements will cause corrosion such as salt, funnel gases, dust or other oxidising agents. These need to be removed from the hold by cleaning before loading. Dust can be hygroscopic, trapping moisture and making corrosion worse.

To prevent atmospheric-induced corrosion, it is essential for holds to be dry and hold air to have a RH below 40%. Other forms of corrosion can be prevented by thorough hold cleaning, freshwater washing and drying.

Any source of water such as wet dunnage, water on the tank top, or in bilges, must be removed prior to closing and securing hatch covers. When at sea, carefully monitor the hold humidity and ventilate when the conditions are correct. In certain conditions, dehumidifying is essential to prevent cargo sweat.

It is the ship's responsibility to ventilate properly or to dehumidify hold air. If steel is damaged by atmospheric corrosion, the receivers will claim damages. Making sure that cargo holds are clean and dry; correctly following the ventilation procedure may not be sufficient to avoid atmospheric corrosion. Dehumidifying hold air will also be necessary.



## Hatch covers

Hatches leak for a variety of reasons, but mainly because of poor maintenance or failure to close them properly. Hatch covers are designed to a weathertight rather than a watertight standard. This means water that passes the sealing gasket should not enter the hold. Drainage channels are arranged to prevent water from entering the hold, by allowing it to drain away.

Steel is easily damaged if it comes into contact with salt water. Prior to loading steel, close and seal hatch covers and test them for watertightness.

In addition, regularly check:

- sealing gaskets for physical damage, detachment or chaffing
- quick acting cleats for the correct tension
- drainage channels for cleanliness, rust or other debris
- cross-joint wedges for damage and/or deficiency
- main securing cleats for damage
- hatch alignment and that metal-to-metal contact provides the correct gasket pressure
- hatch corner non-return valves for damage or deficiency
- hatch locating or pressure points for wear
- compression bars for damage

Include hatch covers in the ship's system for planned maintenance and complete repairs if any of the above are found damaged or deficient.

In exposed locations, hatch covers can be further sealed by placing expanding foam in cross-joints and along the hatch skirt. Cross-joints can also be protected with bitumen-based tape.

The club's survey programme has shown that the principal cause of hatch cover leakage is poor panel alignment and, consequently, incorrect pressure on sealing gaskets. This usually occurs because of wear on metal-to-metal contact surfaces.

See the club's publication 'A Master's Guide to Hatch Cover Maintenance', which is available on [www.standard-club.com](http://www.standard-club.com).





## 10. Safety when working with steel

Steel is dangerous, and care is needed when working with or near steel.

### NEVER

- enter a cargo hold without informing someone
- enter a cargo hold without means to test the hold atmosphere for oxygen
- stand in the fall or swing zone of lifted steel
- enter a dark hold to examine steel without adequate lighting
- enter a cargo hold in bad weather
- tighten wire lashings to the wire's breaking point
- climb between stowed steel, especially steel coils
- walk on or between wet steel
- walk in the path of a coil that is not wedged – it could move



Steel bands are pneumatically tightened.

### ALWAYS

- respect the hazards associated with steel, and work safely
- point out loose or poorly stowed steel to stevedores before they begin work
- stand well back and away from fall or swing zones while steel is being moved
- always wear personal protective equipment
- always wear high-visibility clothing



## 11. Loading checklist

### ALWAYS

- pre-plan steel stowage. Make sure steel is stowed on solid floors and, when applicable, key coils are positioned correctly. Coil widths and/or cargo dimensions may not always permit 'text-book' stowage
- mark the location of solid floors in the cargo space to enable easy reference during loading
- make sure cargo spaces are squared off by construction of a stout buttress or support. Use new timber and remember that No. 1 hold is most likely to be the hold where damage might occur
- wash holds with fresh water before loading, remove all debris and hard objects, fully dry the holds
- when arranging stowage of steel coils, make sure the maximum tank top point load is never exceeded
- arrange for key coils to be placed in such a manner that the coil's bottom edge is one-third of its diameter below the top edge of the coil being locked. Stagger the position of key coils to avoid overloading the tank top
- make sure sufficient dunnage, of the correct type and thickness, is used. Apply dunnage along solid floors
- use dunnage of uniform thickness. Remember, certain countries have import regulations that apply to ship's dunnage; check the regulations before taking dunnage and use only approved dunnage, especially if discharging in North American ports
- record all pre-shipment damage on mate's receipts or bills of lading by carefully describing the damage found and clearly identifying the damaged article
- if required to load wet steel, endorse the bills 'wet before shipment'
- ensure hatch covers are watertight before loading
- load steel dry, especially if steel is packaged (wrapped)
- segregate, and load in a different hold, steel that must be kept dry, from steel that can be loaded wet or products that contain moisture
- work with the surveyor to examine steel for preloading damage, double-check any cargo found damaged. Make an effort to understand what the surveyor is looking for
- whenever surveyors visit to examine cargo, check their credentials to verify who they are acting for, before allowing access to the ship or cargo
- minimise the amount of cargo stowed with metal-to-metal contact. If this type of stowage is unavoidable, make sure the cargo is not wet. Wetness reduces frictional resistance and increases the danger of cargo shifting during ship rolling. Special care is needed when loading during periods of rain showers
- try to avoid loading damaged cargo but accept that this may not be possible, in which case, details of the damage have to be endorsed on the bills of lading. Bent and buckled steel can be shipped for reprocessing, the bills should not record the cargo as 'steel products'
- report to the P&I correspondent or ship's owners when problems are found with cargo or cargo stowage

- take daily dew point readings of hold and outside air, ventilate or dehumidify when necessary. Keep detailed records of these measurements
- remember the voyage ventilation mantra, cold to hot, ventilate not. Hot to cold, ventilate bold
- calculate the ship's GM and, if possible, take measures to reduce high values
- remember that cargo has to be properly chocked and secured, and that only steel coils and semi-finished steel slabs stowed in California block stowage are lashed to themselves. All other steel is lashed to the ship
- point out any ship or cargo hazards or limitations to the stevedores

### NEVER

- rely on stevedores to determine cargo stowage. They may opt for the easiest stowage rather than the best
- use the maximum allowable tank top loading weight to determine the number of steel coils that can be safely loaded. Steel coils produce a point load. The maximum allowable tank top loading weight assumes a homogenous weight distribution
- be surprised if the text book size and type of dunnage is not delivered to the ship. The dunnage supplied may be the best available, in which case, greater application of dunnage may be required
- use wet or 'green' timber for dunnage
- sign, or allow the ship's agents to sign, clean bills of lading or mate's receipts for damaged cargo
- allow coils to be loaded in a pyramid pattern. See section 6 – Round products – coils
- load steel before evaluating the strength of the tank top against the proposed weight distribution
- ventilate when the relative humidity of ambient (outside) air is greater than that of the hold air or when the ambient air's dew point is greater than the temperature of the cargo. These conditions exist when cargo is cold, because it was loaded in winter (cold) conditions for discharge in, or passing through summer (warm) conditions
- ventilate if unsure that ventilation conditions are correct
- stow steel products in the same compartment as cargo with different ventilation requirements
- load steel in holds that have previously carried oxidising agents or acidic compounds, until the holds have been thoroughly washed with fresh water and dried
- think that space remaining in the hold after loading steel needs to be filled with other cargo; it does not. When loading a full cargo of steel, the tank top maximum loading will be reached before the hold is full and often before the ship reaches her marks

## Appendix

### Case study 1 – damaged cargo and clean bills of lading

This study is based on a claim presented by cargo insurers.

#### The cargo

A cargo of steel products was loaded for the Arabian Gulf. The cargo consisted of 600 bundles of black steel pipe and 2,000 steel coils.

The steel was delivered to the port by road and rail, and stored in a covered warehouse. When delivered to the ship, the steel was placed on open trailers.



Steel coils arrive at the berth.



Steel pipes arrive at the berth.

The bundles of pipe each weighed 2 tonnes and were moved by forklift trucks. The bundles were slung with fibre slings and stowed in the ship's hold in the fore and aft direction.

Dunnage was placed between successive tiers of pipe and between the pipe and the ship's side. The coils were moved by forklift trucks, slung with wire ribbon slings and positioned in the ship's hold with a forklift. Dunnage was laid on the ship's tank top. It rained during loading and the cargo on the quay became wet. During prolonged periods of rain, exposed cargo on the quay and in trailers was covered with tarpaulins. However, wet cargo was eventually loaded with dry cargo.

The coils were surface rusted and bound with steel binding, some of which was bent, broken, rusted or missing. Some of the pipes were scratched.

#### The preloading survey

The club arranged a preloading survey and instructed a surveyor to examine the steel for damage before loading and to assist the master with causing of the mate's receipts and bills of lading. During the survey, the surveyor also completed:

- a silver nitrate test in the ship's holds, which did not find evidence of chlorides
- a visual examination of the ship's hatch covers, coamings, compression bars, gaskets, drainage channels and cleats, and found them in good order
- a visual examination of access hatches and ventilation pipes, which were also found in good order

At the end of the survey, the surveyor issued a report and recommended that bills were endorsed with details of the damaged cargo and that loading had occurred during rain and that the steel was wet on shipment. The master issued a note of protest regarding the stowage and lashing of pipes.



Coils are loaded with ribbon slings.





Pipes secured in the hold, but lashings are of little value.



Pipes loaded on top of steel coils.



Coils wedged in position.



Coils being stowed by a forklift fitted with a single round tine.



Coils stowed and lashed together with steel bands.



Coils dropped straight into the hatch square. Note use of wire ribbon slings.



## Clauses and endorsements – wording for the bills of lading

Details of the damaged cargo needed to be endorsed on the mate's receipts/bills of lading and the surveyor attending for the club's preloading survey suggested that the master incorporate the following wording:

- 10% of the pipes nicked, dented and scored along the body of the pipe. A small number, less than 2%, end caps missing. All steel strapping bands showing signs of rust in varying degrees. About 2% of strapping bands missing, loose or adrift. Pipes pre-assembled in open hold square were wetted prior to loading
- 8% of coils showing signs of surface rust to varying degrees and extent. Approximately 10% of the coils' steel bands and wire ties were surface rusted with 5% broken. 20% of the steel coils (no markings available) arrived on the quayside in the rain and were wet prior to loading

The standard recommendations and wording for the clauses that accurately describe the damage and the damaged article on page 9 of this *Standard Cargo* were not used.

The master authorised the charterer's agent to sign bills on his behalf subject to:

- all bills of lading signed by the charterer's agents conformed with the quantities and description of the cargo actually loaded on board the vessel at this loading port and during her present call only
- all remarks endorsed on the mate's receipts must be endorsed in full on the bills of lading issued at this or any other transport bill of lading

The master further made clear that the letter of authorisation was intended to complement the charterparty and must be applied in conjunction with the relevant provisions contained therein and that bills of lading signed by charterer's agents without the above conditions being fulfilled will be considered to have been signed without the authority to do so.

The master further requested the charterer's agent to sign for receipt of the letter of authorisation and acknowledgement of its contents.

## Bills of lading and endorsements

Bills of lading were issued clean by the charterer's agent even though the authority to sign bills granted by the master was subject to the bills being correctly endorsed with details of the cargo. The charterer's agent simply did not include the surveyor's remarks on the bills. The ship had sailed and the master was unaware that clean bills had been issued.

It is normal practice for the master to allow agents to sign and issue the bills of lading on his behalf, but more often than not the appointed agent is the charterer's agent rather than the shipowner's agent. Consequently, the agent is inclined to act in the interest of the charterer rather than the shipowner. Bills are normally issued after the ship has sailed. When authority has been given to the charterer's agent to sign the bills, there is very little a ship's master can subsequently do to check that the cargo's description in the bills accurately reflects its condition.

The charterers came under commercial pressure from the shippers to issue clean bills, because of the terms of the letters of credit. However, this is not in the interests of the shipowner, because clean bills issued for damaged cargo render the shipowner liable for any cargo damage regardless of whether the damage occurred before or after loading (see page 9). On a more serious note, issuing clean bills for damaged cargo may be a fraud against the receivers which can invalidate P&I cover.

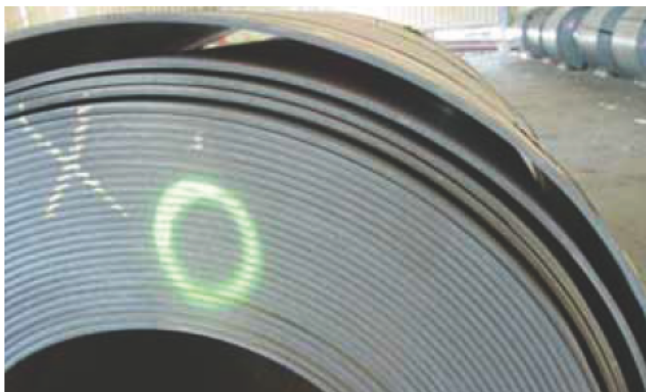
## Letters of Indemnity – LOIs

In commercial reality, the charterparty often contains an LOI clause – depending upon the type of charter. The shippers require clean bills for their sales contracts or letters of credit, and so there is considerable commercial pressure to have clean bills issued. In return for the issuance of a clean bill, a letter of indemnity is offered or agreed. On the face of it, the letter appears to indemnify the owner (or charterer) against the possible consequences of issuing a clean bill for damaged cargo. However, there are a number of pitfalls with this approach:

- issuing a bill of lading that does not reflect the true condition of the cargo is a crime in some countries as it could be construed as an act to defraud the receiver
- such a letter of indemnity is almost always legally unenforceable. Therefore, the value of the LOI is very much dependent upon the probity and reputation of the entity giving the LOI. For example, in a long-term charter, it would be reasonable to assume that the LOI given by the charterer may be honoured. In a contract of carriage or short voyage charter, this may not always be the case
- the shipowner may lose his P&I cover if he or the master knowingly issues or authorises issuance of a clean bill for damaged cargo

## At the discharge port

At the discharge port, joint surveys were carried out to assess the condition of the cargo. After detailed examination, the consignee concluded that the majority of coils were damaged. Many were entangled, bent or crushed, were considered unsuitable for their intended purpose and were rejected. The receiver alleged that as part of the next manufacturing process, the coils would be placed in an acid bath and then drawn out. However, due to the damage, the coils would be difficult to unwind.



Condition of coils at discharge port - unwound.



Condition of coils at discharge port - rusted.

The damaged coils seen at the discharge port were in part caused by their poor condition, noted at the load port. At the load port, the club's surveyor had noted that some of the coils were distorted and sprung, and that retaining bands and ties were broken, adrift and rusting, but the bills were not claused to reflect the cargo's condition.

### The claim

The receivers submitted a claim against the shipowner for 60 damaged coils, all of which were considered a total loss. Cargo interests demanded \$80,000 in settlement for their loss.

### Liability

Where the consignee is different from the shipper, a clean bill is irrefutable evidence of the apparent condition of the cargo at the time of loading. Since the bills issued here were owner's bills of lading, cargo interests had a direct action against the shipowner for breach of the contract of carriage. The shipowner can claim against charterers for reimbursement of any settlement reached with cargo interests, but such recovery action is not always successful because legal costs can be greater than the resulting award.

### Comments and analysis

A clean bill is one that describes the cargo as being 'in apparent good order and condition', without containing adverse remarks. It can be evidence that the cargo was loaded in a good condition. If the bills are not claused with remarks indicating the true condition of the cargo then the carrier is usually held liable to the receiver for the damage or impairment of the cargo.

As a consequence of the charterer's failure to endorse the bills of lading to record the cargo damage, the carrier (shipowner) was liable to cargo interests for the damage, even though the damage existed prior to loading.

To prevent claims arising from incorrect issue of clean bills, the following advice is given:

- masters should always be provided with a copy of the charterparty so that they are aware of the commercial agreement between the owners and charterers with respect to the issuance of bills of lading and letters of indemnity
- deck cargo officers should be diligent in their duties to observe and note damages to the cargo and make sure these are recorded in the cargo log and mate's receipts. They should not rely solely on cargo surveyors. All cargo damage seen should be brought to the master's and surveyor's attention
- wet cargo should not be loaded with dry cargo, such cargo should stay on the quay until it is dry or, alternatively, bills should be cargo claused 'wet when loaded'
- always ensure that bills are claused to reflect the true description of the cargo, using descriptions similar to those set out in this guide
- when agents are authorised to issue bills on the master's behalf, this authorisation should be followed up by an email acknowledgement directly from the master to the agents with the wording agreed for the clausing to be included in the bills of lading
- masters should follow up after departure from the port and request confirmation that bills have been issued as per the master's instructions
- members should take a diligent interest in who issues bills of lading on their behalf and when they are issued. Procedures relating to issuance of bills of lading should form part of the ship's cargo procedures

The mistakes made during loading resulted in a claim against the shipowner even though the ship had not caused the damage. Had the correct procedures been followed, as set out in this guide, the claim would have been avoided.

## Case study 2 – Poor dunnage

This study is based on a claim presented to the shipowner by cargo receivers.

A consignment of 2,400 steel pipes and 1,500 pipe casings was loaded at various Chinese ports for discharge in Antwerp. Each pipe weighed approximately 3.5 tonnes and each casing weighed between 0.5 and 1.2 tonnes. Wooden bulkheads were built in No.2 hold to correct the ship's shape and to enable block stowage. Flat dunnage was laid athwartships over hold strong points for the pipes to sit on, but dunnage was not placed between the pipe ends and the hold's transverse bulkhead.

The club's surveyor who attended for the preloading steel survey examined the cargo and suggested that bills be endorsed to reflect that:

- cargo had lain in the open without protection or covering
- cargo was rusty along its edges and surfaces
- cargo was slightly scratched along its edges and on its surfaces
- 89 pipes had their protecting end covers missing

In spite of these recommendations, the bills of lading were signed clean.

During the voyage, heavy weather was encountered and a number of the wooden bulkheads in No. 2 hold wings collapsed and allowed the pipes to move. Pipes located close to the hold's transverse steel bulkhead struck it and were damaged.

At the discharge port, the outturn surveyor remarked that 10% of the pipes had one or both ends bent or flattened. Their end covers were missing.

### Comments and analysis

The principal cause of the damage was poor preparation of the hold prior to loading cargo, and poor stowage during loading. In particular, insufficiently strong timbers had been used to square off the hull's shape in No. 2 lower hold and the wooden bulkhead was weak. In addition, during loading, dunnage had not been placed between the ends of the pipes and the hold's transverse bulkhead.

Stout dunnage should always be used to square off a hold's shape. Deck officers should supervise the construction of timber shoring to make sure it is correctly built and sufficiently strong. Although mariners may not always have experience in construction of timber shoring, they should check that the construction appears correct. Flimsy timber is unlikely to be sufficiently strong to withstand the forces associated with heavy ship pitching and rolling during a storm. If in doubt advice should be sought.

Dunnage should always be placed vertically between the ship and cargo to prevent cargo movement and to protect the ship and cargo from damage.

Receivers were able to claim against the ship even though the damage occurred during bad weather. Had the wooden bulkheads been more robust, it is probable the damage, and the claim, would have been avoided.



Pipes are stowed fore & aft and athwartships. Dunnage has not been placed between the pipes stowed athwartships and the ship's side bulkhead.



Pipes loaded on top of coils need to be securely lashed to prevent movement. Dunnage has been placed between the pipes and the longitudinal bulkhead.





## Acknowledgements

### About the authors



#### Eric Murdoch

Eric is the Standard Club's chief surveyor. He holds a Bachelor of Science in marine technology and Master of Science in ship production. Eric has previously worked as a ship's deck officer, ship design engineer and as a ship surveyor. He joined Charles Taylor in 1987 and is a member of the Institute of Marine Engineers, the Royal Institute of Naval Architects, the Society of Consulting Marine Engineers and Ship Surveyors. He is a Chartered Engineer.



#### Albert Weatherill

Albert Weatherill is the managing director of McAusland & Turner, one of the oldest and most respected marine consultancies in the UK. His sea-going career began on reefer ships before progressing to ro-ros as well as managing a fleet of 15 fishing vessels whilst working on the world's largest fish-meal factory vessel. Joining McAuslands in 1982 was his first introduction to steel products. From that point onwards, he conducted surveys on several steel cargoes per week, eventually travelling Europe, the US, Africa and the Far East investigating steel claims on behalf of P & I Clubs and their members. He continues to be consulted by the wider shipping industry on steel cargoes.



#### Peter Barton

Peter Barton is a Hong Kong-based independent marine consultant currently working for China Navigation. His career in the shipping industry has spanned 46 years of which all but the first six in the Bank Line have been with companies of the Swire group. He has over the years been closely involved with the group's unitisation, containerisation, crane ship and bulk transfer programmes from both ashore and afloat.

He has served as Master in both Swire Pacific Offshore and CNCo and as Commodore in the latter on its multipurpose vessels. As a consultant, he has carried out port and cargo handling studies as well as contributing to CNCo's safety management system and cadet training programmes. He is also closely involved with project development for Swire-CTM Bulk Logistics.



CHINA NAVIGATION

## Safety & Loss Prevention team

Director of Loss Prevention

**Chris Spencer**

+44 20 7680 5647

chris.spencer@ctcplc.com

Chief Surveyor

**Eric Murdoch**

+44 20 7522 7440

eric.murdoch@ctcplc.com

Senior Surveyor

**Julian Hines**

+44 20 7522 6465

julian.hines@ctcplc.com

Surveyor

**Mark Ford**

+44 20 332 02316

mark.ford@ctcplc.com

Safety & Loss Prevention Executive

**Colin Legget**

+44 207 260 2311

colin.legget@ctcplc.com

Administrator

**Christine Mills**

+44 20 7522 7522

christine.mills@ctcplc.com

#### The Standard Club

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Charles Taylor & Co. Limited  
International House, 1 St. Katharine's Way,  
London, E1W 1UT England

Telephone: +44 20 7488 3494

Emergency mobile: +44 7932 113573

E-mail: p&i.london@ctcplc.com

Please send any comments to the editor –

Chris.Spencer@ctcplc.com

Telephone: +44 20 7680 5647

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